

## Sessions B&F summary

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### INTRODUCTION

This paper summarizes the sessions B&F of the 33<sup>rd</sup> ICFA Advanced Beam Dynamics Workshop on High Intensity & High Brightness Hadron Beams held in Bensheim, Germany. It covers high intensity linacs, front ends and proton driver topics.

We had 14 invited talks and 6 contributed talks:

#### *Invited talks*

- Aleksandrov (ORNL): Commissioning Experience for the SNS Linac
- Y. Kondo (JAERI): Beam dynamics and commissioning of J-PARC linac
- R. Ferdinand (CEA): IPHI project
- P. Ostroumov (ANL): High-Intensity heavy ion driver linac for the RIA facility
- L. Groening (GSI): Heavy ion high intensity upgrade of the GSI UNILAC
- J-L. Biarrotte (IPN-Orsay): Beam dynamics studies for the fault tolerance assessment of the PDS-XADS linac design
- S. Geer (FNAL): Proton driver, super neutrino beam and neutrino factory
- R. Garoby (CERN): The SPL at CERN
- H. Choi (KAERI): Proton Engineering Frontier Project (PEFP)
- U. Ratzinger (U. Frankfurt): The 70MeV p-injector design for FAIR
- Prior (RAL): RAL proton drivers and ISIS upgrade plans
- B. Weng (BNL): The BNL Super Neutrino Beam Project
- B. Foster (FNAL): The Fermilab Proton Driver Project (presented by W. Chou)
- S. Krishnagopal (CAT): The Indian Proton Driver Project

#### *Contributed talks*

- J. Jang (PEFP Korea): Beam Dynamics Design of the PEFP 60 MeV DTL
- R. Keller (LBNL): A Hybrid Ion Source Concept for a Proton Driver Front-end.
- A. P. Durkin (RAS Moscow): Channel parameters perturbation as a source of beam losses in High-Power Linac
- H. Podlech (IAP): Development of Superconducting CH-Structures for Low and Medium  $\beta$  ion Beams
- A. Franchi (GSI): Benchmarking linac codes for the HIPPI project
- S.E. Kopp (U Texas): Status of the NuMI Neutrino Beam

### HIGH INTENSITY LINAC / FRONT END

The session was divided in 3 major classes of topics:

- Improvement of existing facility (GSI)
- Projects under construction (SNS, J-PARC, IPHI)
- New projects (RIA, ADS)

Exciting new results were shown from the 2 new major projects SNS and J-PARC. Warm parts of the linacs were commissioned for both projects and beam was accelerated.

GSI was able to improve by a factor 5 the current of their reference ions in the past two years. They have plans for future upgrades of their linac.

RIA project is more or less ready for CD1 meaning they should soon receive money for construction.

The ADS fault tolerance reliability study assesses the break of cavities and the recovery process. It will be useful for other design.

## PROTON DRIVER SESSION

There are numerous proton drivers around the world and the talks highlighted two kinds of projects:

- Upgrade of existing machines (ISIS, AGS, Main Injector)
- New machines (J-PARC, SPL, PEPF, FAIR, RAL driver, India driver, BNL 1.2 GeV linac, Fermilab 8 GeV linac)

Three types of drivers were presented: rapid cycling synchrotrons, warm RF linac and superconducting RF linac. All the designs presented show the same common features: high beam power, low losses, innovative design and state-of-the-art technology.

## WORKING SESSION

### Talks

Topics from source development to experiment status were presented. There were too many to summarize them in this paper. Globally, one can say that many of the issues presented on new proton machines will be addressed with the European HIPPI project (Joint Research Activities – upgrades and R&D programme on pulse proton machine).

No single approach was observed in designing new projects. The old codes from Los Alamos are still in use, proving to be still acceptable for the community. New codes arise going deeper in detail.

New types of SC cavities emerge, which is good for the accelerator community.

### Discussions

One of the discussions commented the modeling and its impact on linac machine design. The designers use some “rule of thumb” judgment, for example on beam size to bore radius safety. Different approaches among the projects were presented. An analysis should be performed to assess this point and to provide rules agreed all over the world.

An agreement among the participants was observed on front end modeling (ion source and LEBT). Clearly,

the simulations need improvement. Iteration on design is often empirical.

Modeling from MEBT through accelerating structures could benefit from benchmarks with real machine data. The work will be achieved within HIPPI on the GSI Unilac. SNS will attempt to provide a set of beam conditions and measured profiles for the community.

The last point was dedicated to express a desire for mini-workshop on linac Proton drivers. Among the issues to be covered, one can be the experience of superconducting cavities of low and medium beta. The idea is to provoke fair comparisons and offer choices of intermediate energy cavities. Too often, the designers use cavities development in their own lab without all the information needed to choose over a wide range of cavity types. The second topic which could be covered with this mini-workshop deals with number of cavities per klystron. FNAL, ANL, LBNL and CERN are among the interested parties to sponsor such a workshop.